Space Weather Forecast

Issued on Tuesday, 10 October 2023 at 13:13 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of isolated Moderate flares throughout but Likely Days 1-3 (10-12 Oct). Chance G1/Minor Geomagnetic Storm intervals Days 1-3 from coronal hole fast winds and Coronal Mass Ejection arrival (11-12 Oct). Slight chance of R1/Minor Solar Radiation Storms throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: An isolated moderate flare was observed from the moderately sized sunspot region in the northwest, with frequent common-class flares otherwise. There are currently eleven sunspot regions visible on the solar disc. The northwestern spot is the largest and most magnetically complex, with persistence of a weak mixed polarity spot on its trailing portion. There is a further smaller, but also complex region, towards the centre disc which also contains a moderately strong mixed polarity spot on its trailer. The remaining regions are all comparatively smaller and simpler. No Earth-directed CMEs (coronal mass ejections) have been detected. A CME observable on the latest coronagraph imagery (from around 10/1030 UTC) is yet to be analysed, however, it does not appear to have emanated from a feature on the visible disc.

Solar Wind / Geomagnetic Activity: Solar winds have persisted at generally slow-ambient levels, with no definitive indication of the arrival of fast winds from a coronal hole. Total interplanetary magnetic field (IMF) strength was weak. The north-south component has also been largely weak and negative (southward) but since 09/1800UTC has remained largely weakly positive (northward). Geomagnetic activity has been Quiet to Unsettled (Kp 1-3).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained at background levels, with no solar radiation storms observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity is expected with isolated Moderate flares likely. There is a slight chance of a very isolated Strong flare, from either of the two complex sunspots, one in the northwest and the other in the southeast. The risk of significant flares is expected to gradually decline by Day 4 (13 Oct) as the complex region in the northwest rotates fully across the western limb. However, emerging or returning regions during the period maintains the chance of Moderate flares throughout.

Solar Wind / Geomagnetic Activity: There is one Earth-directed Coronal Mass Ejection (CME) which is anticipated to arrive either late Day 2 (11 Oct) or early Day 3 (12 Oct). Current slow wind is expected to transition into streams of fast winds from a pair of coronal holes later Day 1 or Day 2 (10-11 Oct). This likely bringing peak winds of around 500-600 km/s. Quiet (Kp 0-2) geomagnetic activity will increase to Unsettled to Active (Kp 3-4) at times of Days 1-3 (10-12 Oct) with the onset of the fast winds, and more probably with the CME arrival. There is a slight chance of a G1/Minor Geomagnetic Storm (Kp 5) Days 1-2 with the fast wind enhancements, and a chance of G1-G2 Minor/Moderate Geomagnetic Storm (Kp 5-6) intervals Day 2-3 (11-12 Oct) with the CME arrival.

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Some slight enhancement to the aurora are likely Days 1-3 due to the combined effects of fast solar winds and the potential arrival of a Coronal Mass Ejection (CME) late Day 2 or early Day 3. This CME arrival may produce slightly stronger enhancements, with a greater potential for viewing aurora across northern Scotland and similar latitudes under clear skies.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is most likely to remain at background levels, but with a slight chance of enhancements to R1/Minor Solar Radiation Storm levels if any notable flares occur from either of the complex sunspots on the disc.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	20	30	30	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	50	50	40
Very Active	R3 to R5 X	No	10	10	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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